PATENT SPECIFICATION

DRAWINGS ATTACHED

885,101

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COMPLETE SPECIFICATION

Conduit for the Circulation of Fluids and Method for Producing the Conduit

We, SOCIETE CONTINENTALE DE PROCEDES DE SOUDURE A FROID (SOUDFROID), a French Body Corporate of 1, place d'Estienne d'Orves, Paris 9° (Seine), France, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a conduit for the circulation of fluids and to a method of producing the conduit.

The invention has among its objects to provide a method for producing a conduit or system of conduits for the circulation of fluids, together with the articles of manufacture obtained thereby, and it covers chiefly but not exclusively heat exchangers, and systems for feeding fuel to domestic apparatus, such as kitchen stoves.

It is a well-known fact that the manufacture of such conduits requires the solution of numerous problems, due more particularly to the fact that such conduits are of a compound structure and require the use of pipes provided with a number of bends and welds or connections. Furthermore, such pipes are associated with devices of various types such as burners, thermostats, adjusting cocks and feed nozzles. The fitting of such devices on the pipes raises problems which it has been hitherto difficult to solve economically.

The method of the invention consists in that the conduits forming the circuit or network are obtained by a plastc deformation of at least one of two plates or sheets of a metal or of a metal alloy adapted to be deformed at room temperature, after which deformation the connections are made at the desired positions and, finally, the two sheets are welded together by cold welding, the weld being effected along the edges of the conduits thus enabling the sheets to be cut for the purpose of removing those parts of the sheets between the conduits.

The expression "metal sheet" used hereinafter is to be construed as meaning any metal sheet of a metal adapted to be deformed and also of any compound sheet obtained by the assembly of two sheets of metal, of which one at least is made of a deformable metal.

In a preferred embodiment of the invention, it is possible to obtain a heat-exchanging conduit having a transverse cross-section which is substantially circular by impressing half of the conduit selectively on each of the two metal sheets to be associated, and assembling said sheets in a manner such that the impressions thereon register with each other. More particularly, when the conduit is to feed burners, thermostats and like devices, the connections between the conduit and said apparatus are provided with flanges and are fitted inside bores extending through the impressions made in one of the sheets in a manner such that the flanges rest against the inner surface of said metal sheet, so as to be welded at room temperature to the metal sheet. It is apparent that with the method according to the invention, it is possible to manufacture by a series of simple operations, fluid-feeding conduits of any shape, adapted to be associated with any type of device.

The material to be preferred for the formation of the plates and connections is copper, aluminium or an alloy of copper and aluminium. It is possible to form in accordance with the invention compound copper and aluminium assemblies.

The plastic deformation of one or both metal sheets, is effected, according to the intricacy of the tubular structure by stamping, swaging or by any suitable equivalent means.

A particular application of the invention is to the evaporators of refrigerators in which case it is easy to produce through suitable

impressions a unit including both the boiler and the heat-exchanging conduits. Once the cold welding operations have been carried out, it is possible to cut out and remove the sections of the metal sheet which do not form part of the actual conduit and which extend between the conduits.

The accompanying drawings illustrate, by way of example, two embodiments of the invention, in which:—

Figure 1 illustrates, by way of example, the evaporator of a refrigerator in plan view from above;

Figure 2 is a cross-section on the line II—II of Figure 1;

Figures 3 and 4 illustrates a modification;

Figure 5 is a side elevation of a conduit for feeding gas to a gas stove for a kitchen, and

Figure 6 is a corresponding plan view from above.

The heat exchanger illustrated in Figure 1 in the shape of an evaporator for a refrigerator is obtained starting from two metal sheets 1 and 2, the metal sheets being made of copper, aluminium or aluminium alloy or, of any ductile metal which is capable of being extruded or deformed at room temperature. It is also possible to use for this purpose compound sheets, such as thin sheets of steel, or like metal coated on at least one of their surfaces with a metal of the kind disclosed, such as copper.

In Figure 1, the sheet 2 or the surface to be coated with one of the metals referred to in the case of a compound sheet is impressed with a series of depressions such as 3, 4, 5, in which case the depression 3 forms the actual conduit of the heat exchanger, while the depressions 4 and 5 form the boiler.

Having made the impression in sheet 2, the sheet 1 is suitably brushed and then laid over the sheet 2, which has been also brushed, and which is provided with the above-mentioned depressions 3, 4 and 5; the seams such as 6, 7, are then cold welded in a manner well known in the art, whereby the continuous conduit obtained is perfectly fluidtight and may be provided with a tube 9 and a tube 10 serving respectively as inlet and outlet for a liquid or gas.

The shape of the conduit is irrelevant, as also the size of the depressions provided in the sheet 2. As illustrated in Figure 3, it is possible to impress also in the sheet 1, depressions 11 and 12 which are identical with and arranged in the same manner as the depressions 13 and 14 formed in the metal sheet 2. In the assembly which is effected in the manner hereinbefore described, the depressions 11 and 12 forming one half of the conduits are laid in registry with the corresponding depressions 13 and 14. It is possible to obtain in this manner a conduit having a double transverse cross-sectional area without it being necessary to subject either of the metal sheets to a plastic deformation of an exaggerated magnitude. It is also possible to adopt such an arrangement for certain parts only of the conduit.

The heat exchanger thus obtained is flat and it is possible to use it as such. It is also possible, as illustrated in Figure 4, to wind the heat exchanger spirally, so that it may require less room lengthwise. It is also possible to cut out all or part of the sheet elements lying between the sections of the conduit, so as to obtain an independent conduit which may be subjected to any technically required deformation.

Referring to Figures 5 and 6, 16 and 17 designate two sheets made for example of aluminium and lying in superposed relationship; the two sheets 16, 17 include sections 18 and 19 bent at right angles to the main section, so that the sheet assembly forms a horizontal plate 20 adapted to cover a gas stove, and a vertical plate 21 adapted to carry the adjusting cocks within reach of the operator.

Cold weld seams designated generally by the reference number 22 define a plurality of conduits 23, 24, 25, 26, and 27. These conduits open into larger terminal elements in which are fitted the connections 28, 29 and 30. The connections 28 are intended to carry the adjusting cocks, of which one is shown at 31, while the connections 29 are for carrying pipes leading to a thermostat 32; lastly, the connections 30 are intended to carry the burners of the stove.

The gas stove conduit is manufactured as follows: the metal sheets 16 and 17 are subjected before folding to a plastic deformation, so as to produce the desired shape to be given to the walls of the conduits to be made. The sheet 16 is then bored at the locations corresponding to the connections 29 and 30 and the metal sheet 17 is bored at the location corresponding to the connection 28. The flange of each connection, which flange is not shown in the drawings, is then welded to the inner surface of the corresponding sheet, so that the connections may project through the outer surface of the sheet.

The two sheets are then superposed and are welded at room temperature along the cooperating edges of the conduits thus formed by means of a tool mating the shape of said conduits.

Lastly, the vertical section 21 is folded to the desired position.

These operations being effected, it will be apparent that it is possible to fit on the connections, now rigid with the conduit devices such as cocks, burners and thermostats, after which the fluid-feeding conduit may be incorporated with a domestic apparatus, so as to be ready for operation.

WHAT WE CLAIM IS:—

1. A method of producing a conduit for

the circulation of fluids, consisting in deforming at least one of two sheets made of a metal or alloy adapted to be deformed at normal temperature, to produce therein a depression following the desired shape of the conduit, assembling the two sheets to form a hollow section, and cold welding the sheets together along the edges of the conduits thus formed.

2. A method as claimed in Claim 1, according to which both sheets are provided with deformed depressions each forming a longitudinal half of the final conduits to be obtained, said half-conduits registering with each other in the assembled sheet structure.

3. A method as claimed in Claim 1 or 2, according to which the connections with the conduits are obtained by producing openings in the deformed sheet at the desired positions of the conduits the flanges of the connections being introduced through said openings with the flanges engaging the inner surface of the sheet, so that the connection projects externally of the assembled sheet structure.

4. As an article of manufacture, a conduit obtained by the method claimed in any of the preceding claims, such as a boiler and heat exchanger for the evaporator of a refrigerator or for the gas feed to a kitchen stove.

5. A method for producing at normal temperature a conduit for fluids, and fluid conduits obtained by said method, substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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Fig.1

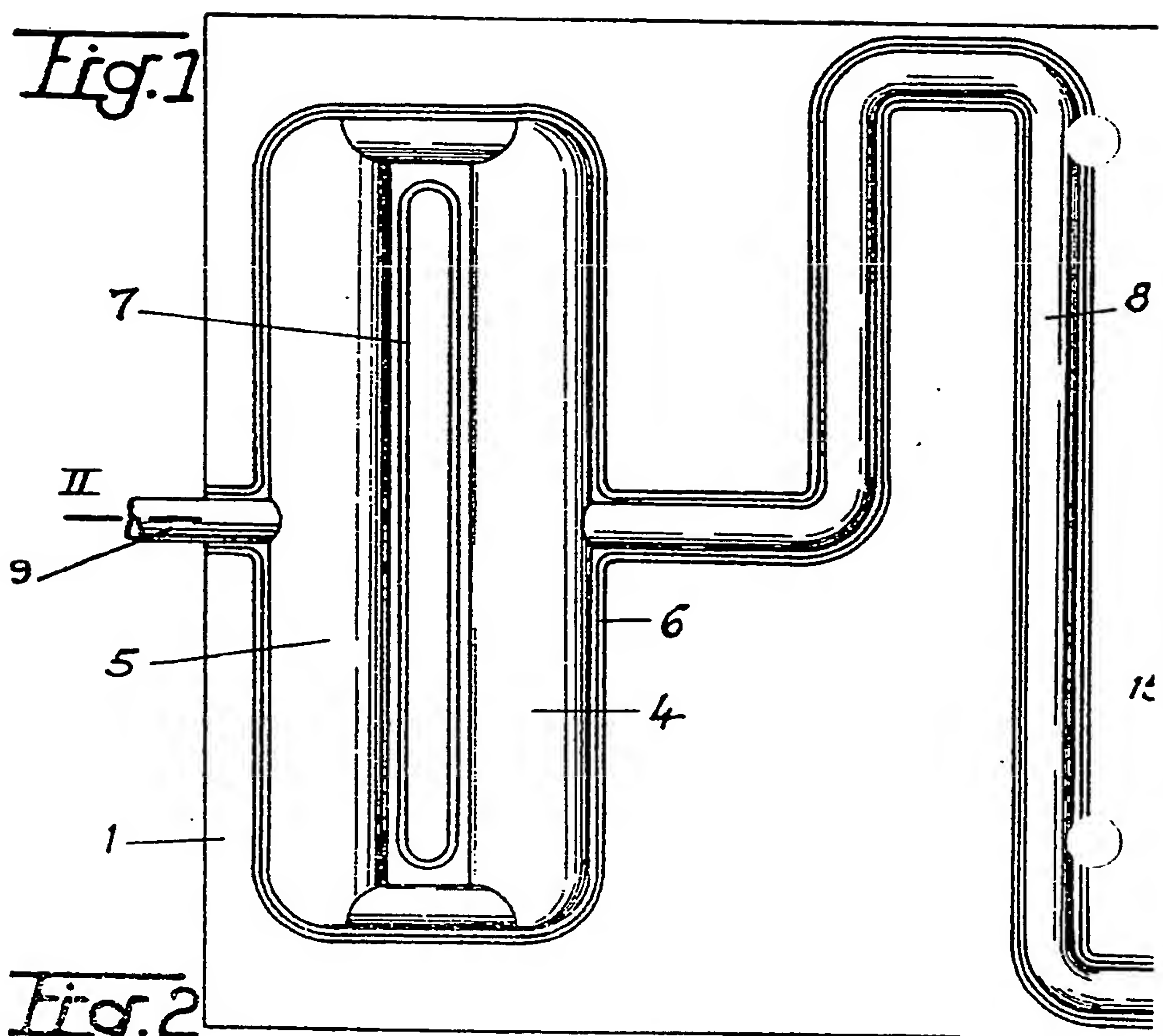
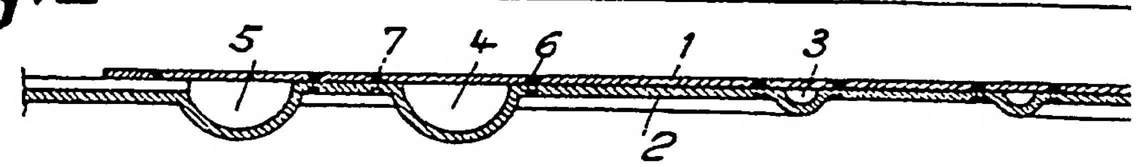


Fig.2



885,101 COMPLETE SPECIFICATION
2 SHEETS

This drawing is a reproduction of the Original on a reduced scale.
SHEET 1

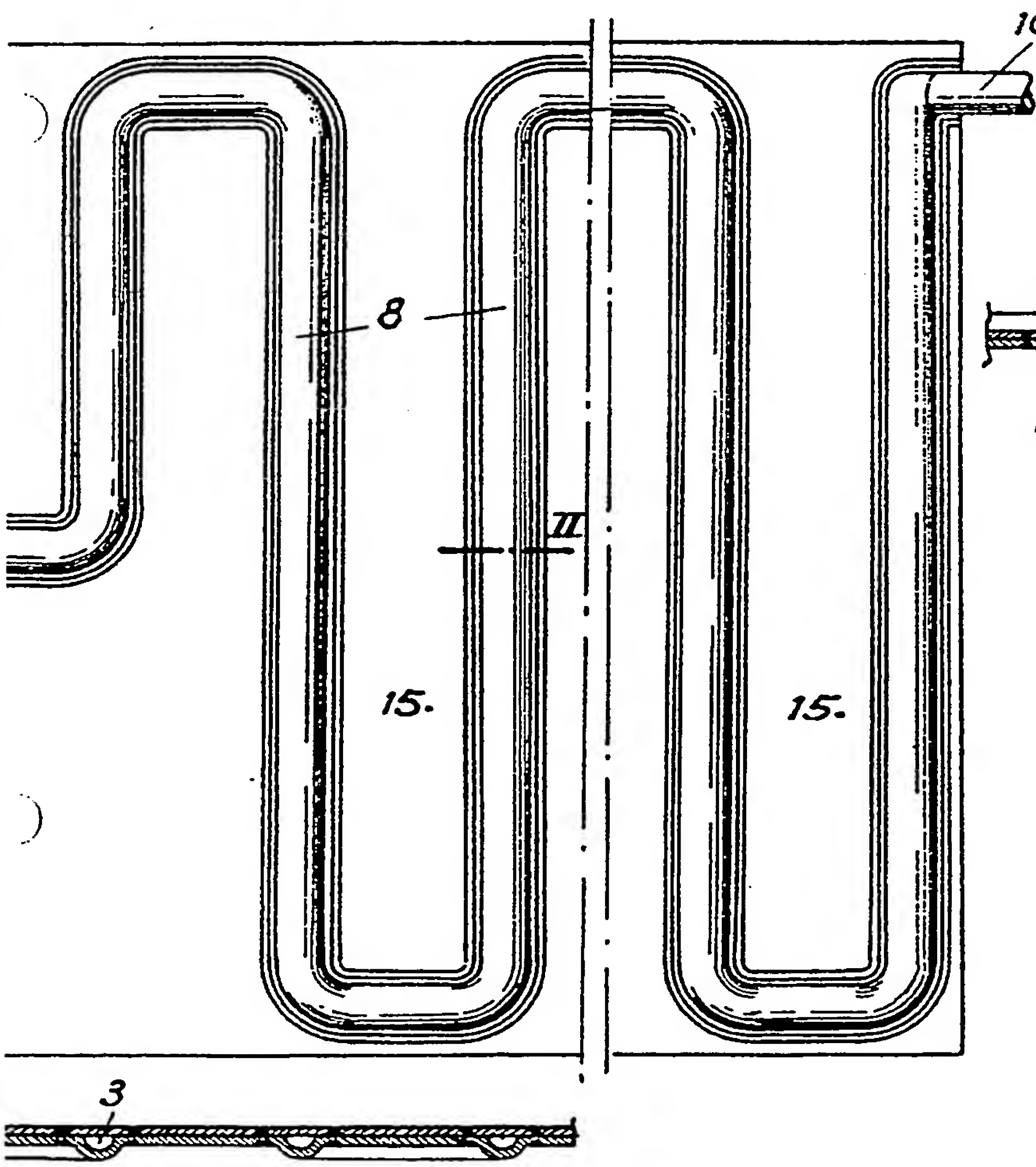


Fig. 3

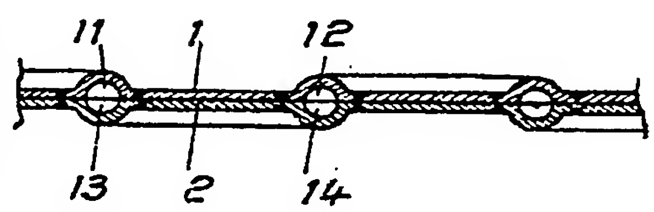
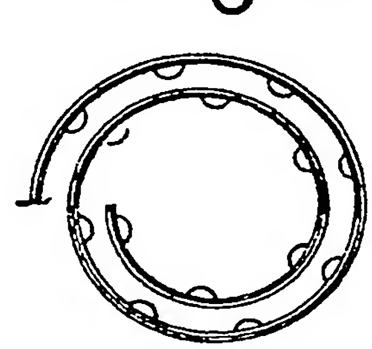


Fig. 4



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SHEET 1

Fig. 1

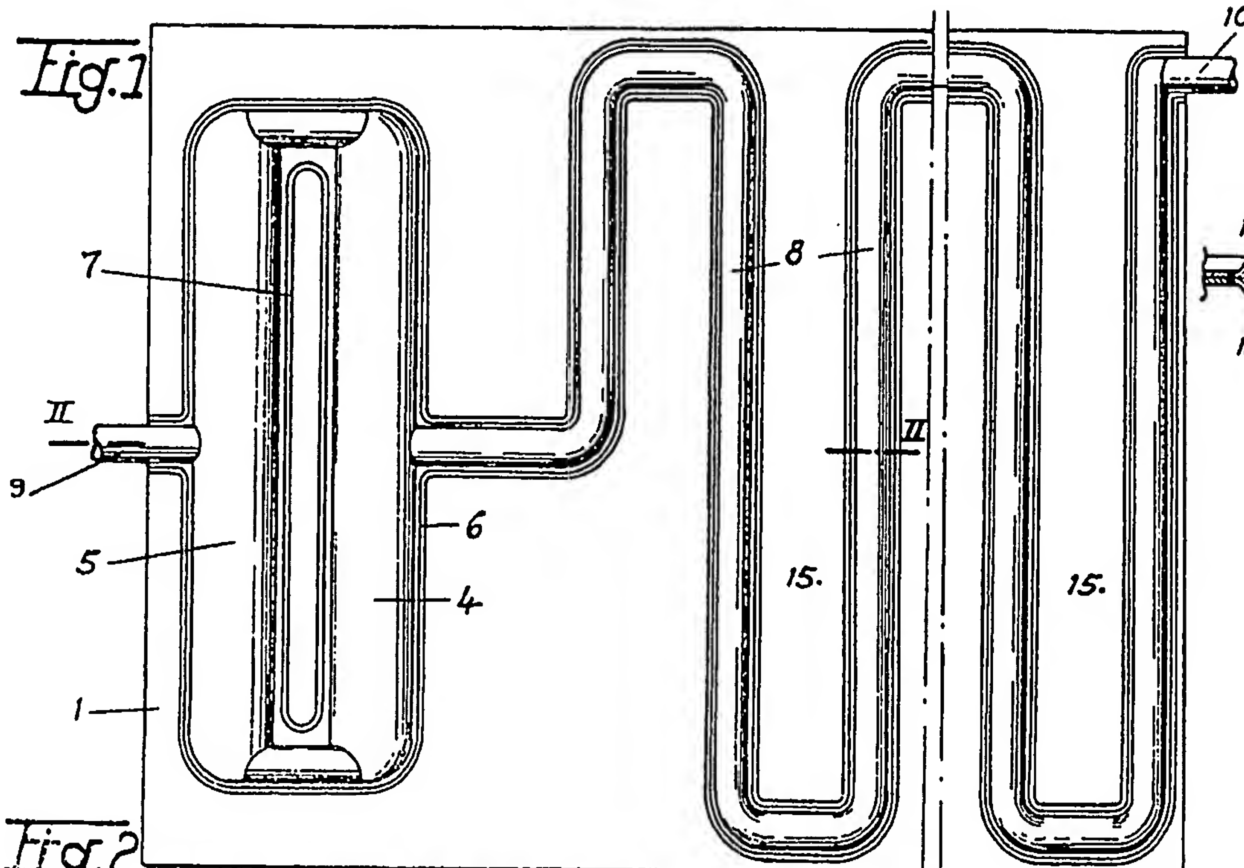

Fig. 2

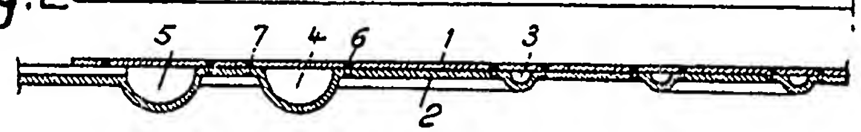

Fig. 3

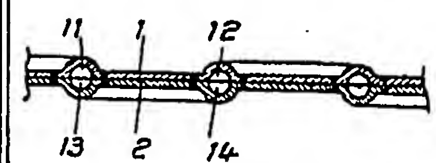

Fig. 4

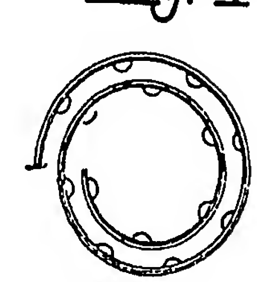

Fig. 5

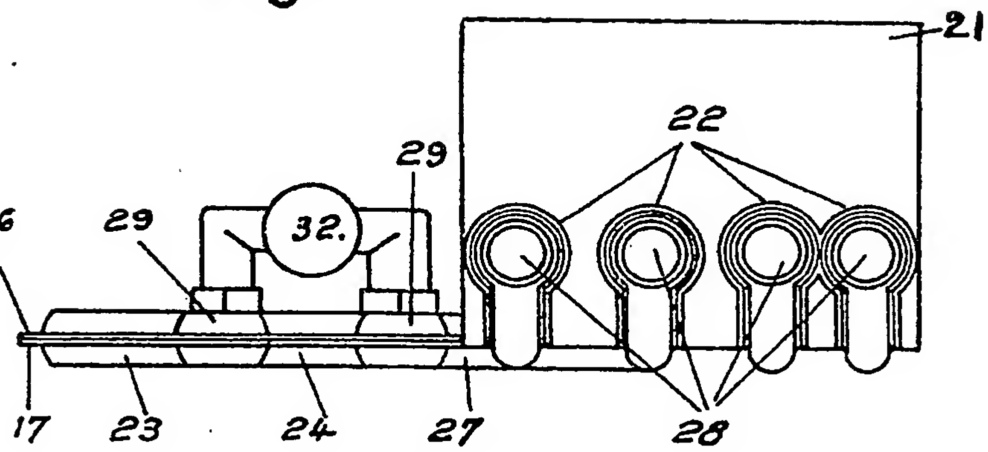
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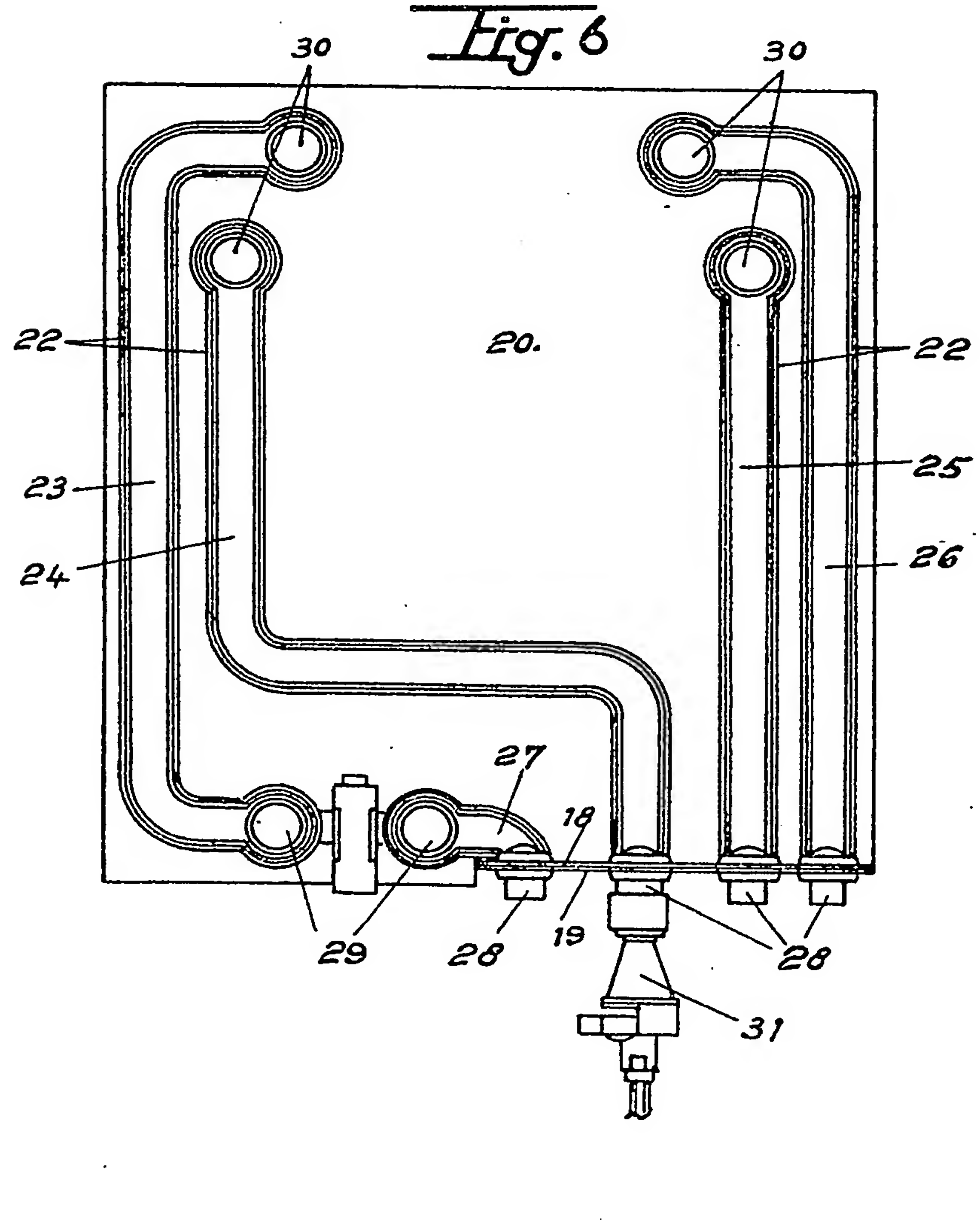
Fig. 6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